

Digital Cardiovascular Imaging in Modern Clinical Practice: Insights From Medical Professionals

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ABSTRACT

Objective: Medicine is highly dependent on medical imaging particularly digital images, for education, research and clinical decision making. This study aimed to explore the utilisation of digital medical image resources among medical professionals in Pakistan.

Methods: This qualitative study was conducted using in depth semi structured interviews of 20 senior medical professionals from basic and clinical medical sciences at King Edward Medical University and Mayo Hospital Lahore. Purposive sampling was employed and data were analysed using a grounded theory approach.

Results: All participants utilised electronic image resources. Google Images was the most frequently used source while clinical faculty preferred point-of-care platforms such as Up To Date. Barriers included internet issues, copyright restrictions, and paid access.

Conclusion: Digital medical image resources are widely used by medical professionals. Improving access to reliable, high-quality imaging resources may enhance education, clinical decision-making, and patient outcomes.

Keywords: Digital imaging, Medical image resources, Clinical decision-making, Health professionals, Pakistan.

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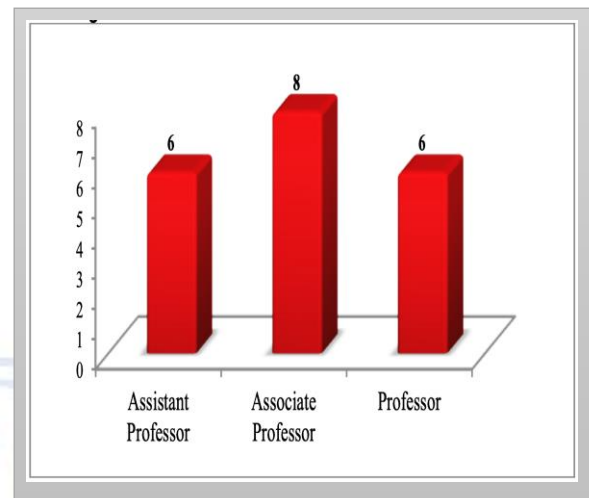
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INTRODUCTION

Cardiovascular medicine and cardiac surgery are among the most image-dependent disciplines in modern clinical practice. Digital cardiovascular imaging modalities such as echocardiography,

coronary angiography, cardiac computed tomography (CT) and cardiac magnetic resonance imaging (MRI) play a central role in diagnosis, procedural planning, clinical decision making and patient follow up. The rapid

evolution of electronic imaging technologies has transformed how medical professionals access, interpret and apply visual data in both educational and clinical settings. Medical images are routinely used by clinicians, surgeons, researchers, and educators to support clinical reasoning, enhance understanding of disease processes, and improve patient outcomes. In cardiology and cardiac surgery timely access to accurate and high quality digital images is particularly critical as clinical decisions often need to be made during ward rounds, emergency presentations and interventional or surgical procedures. Therefore the ability of health care professionals to efficiently search, retrieve and utilise digital cardiovascular images has become an essential competency. Information seeking behaviour related to medical imaging is influenced by clinical context, professional expertise and available technological infrastructure. Health care professionals familiarity with digital image resources directly affects their utilisation for clinical decision making, teaching and research. Understanding these behaviours is important for the development of effective digital image retrieval systems that can support the specific needs of cardiology and cardiac surgery practice. Previous studies conducted in developed countries have demonstrated extensive use of electronic medical resources, including digital image databases and point of care platforms, by clinicians for rapid clinical decision making. However limited evidence is available from developing countries, particularly Pakistan,



regarding how medical professionals utilise electronic cardiovascular imaging resources in their routine practice. Given the increasing burden of cardiovascular disease and the expanding role of advanced imaging, exploring the attitudes and practices related to digital cardiovascular image utilisation is both timely and relevant. This study aims to explore the attitudes of medical professionals toward the utilisation of digital medical image resources, with particular relevance to cardiovascular and cardiac surgery practice for education, research and clinical decision making within the Pakistani health care context.

METHODOLOGY

This study employed a qualitative research design to explore the information-seeking behaviour and utilisation patterns of electronic medical image resources among medical professionals. A pragmatic approach grounded in grounded theory methodology was adopted to gain in depth insights into participants experiences and perceptions regarding digital medical image use

for education, research, teaching, and clinical decision making.

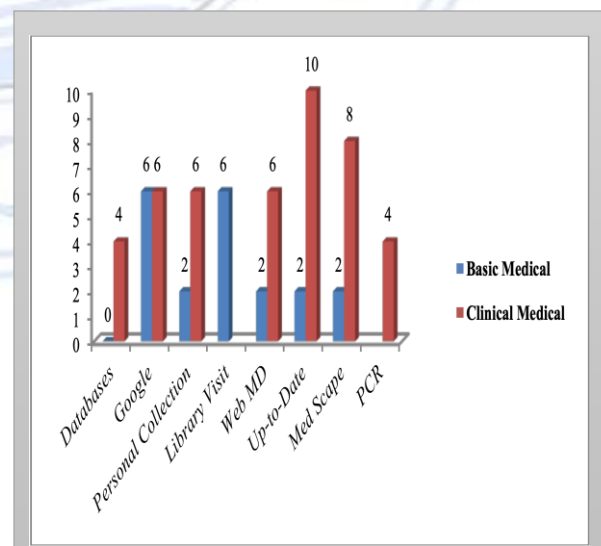
The study population comprised senior medical faculty members from KEMU and its affiliated Mayo Hospital, Lahore, Pakistan. A purposive sampling technique was used to select participants who were most likely to use medical images in their professional practice. In total 20 medical professionals were included, representing both basic medical sciences (Anatomy, Community Medicine, and Forensic Medicine) and clinical medical sciences (Medicine, Radiology, and Cardiology). Participants held academic ranks of Professor, Associate Professor and Assistant Professor with qualifications including MBBS, FCPS, MPhil, and PhD degrees. Data were collected through in depth, semi structured interviews, conducted after obtaining approval from the Institutional Review Board (IRB). An interview guide was developed with input from experts in both medical and information sciences to ensure content validity. The guide focused on participants use of medical image resources, preferred formats and sources, purposes of image utilisation and challenges encountered during image retrieval. Appointments were scheduled in advance and interviews were conducted through face to face interactions at participants workplaces. Ethical considerations were strictly observed; participants were informed about the purpose of the study, assured of confidentiality and provided consent prior to participation. Following data collection, interview responses

were analysed thematically and participants were given the opportunity to review the analysed data to ensure accuracy and credibility of interpretation.

This methodological approach enabled a comprehensive understanding of medical professionals engagement with digital medical image resources within a real world clinical and academic context.

Results

Google Images was the most used source for searching for digital medical images, with 100% of the 20 participants using Google Images. There was a large variation in the use of the images by the clinical faculty compared to the basic science faculty. The clinical faculty used the most up-to-date digital images for point-of-care clinical decision-making. The basic science faculty used the images mainly for teaching, and making educational presentations. There were many purposes for using the medical images such as teaching, clinical decision-making, research, and



educational presentations. The findings show a big difference in the types of images that clinical and basic science faculty need. The clinical faculty members needed the images to be of the highest resolution and for them to be very detailed in order to help with patient care. The basic science faculty members needed images for teaching and for conceptual understanding. These several barriers and/or obstacles when effectively and optimally using digital medical images (resources) were systematically identified. These are namely very limited, unreliable and/or often non-existent Internet connectivity; subscription(s) / paid access to premium databases (of digital medical images) of high academic value; and (often archaic and/or outdated) Copyright restrictions that pose problems when (digital medical) images are (to be) used for educational or/and publication purposes in academic settings. The study found key differences between basic medical science digital images and clinical faculty images. In general, basic science faculty used rather general teaching images, whereas clinical faculty required in great detail and at high resolution images for clinical purposes.

DISCUSSION

The findings of this study demonstrate a strong preference among medical professionals for electronic medical imaging resources, particularly among clinicians. This preference is highly relevant to cardiology and cardiac surgery, where clinical practice depends heavily on rapid access to detailed cardiovascular images for

diagnosis, intervention planning and patient management. The reliance on digital imaging reflects the time-sensitive and high-stakes nature of cardiovascular care. This pattern of use aligns with the workflow of cardiology and cardiac surgery services, where clinicians often require immediate access to validated imaging resources via mobile devices rather than traditional library-based sources.

This difference reflects the distinct requirements of medical specialties. In cardiology and cardiac surgery, such detailed imaging is essential for accurate interpretation of cardiac anatomy, assessment of pathology and planning of interventional or surgical procedures, which may directly impact patient outcomes and recovery.

These challenges may disproportionately affect cardiovascular specialists, for whom delayed or limited access to appropriate imaging resources can hinder timely diagnosis and treatment. Addressing these barriers is therefore critical to optimizing cardiovascular care delivery.

The participation of medical professionals in training workshops related to literature searching and digital resource utilisation underscores the importance of continued professional development. For cardiology and cardiac surgery faculty, ongoing training in digital image retrieval and evaluation is essential to ensure accurate interpretation and evidence based application of cardiovascular imaging in clinical practice.

Overall, the findings suggest that improving access to high quality, reliable and easily

retrievable digital cardiovascular imaging resources may enhance clinical efficiency, support informed decision making, and ultimately contribute to improved patient care outcomes.

ETHICAL APPROVAL:

This study was approved by the Institutional Review Board of King Edward Medical University (IRB approval no. [XXX], dated [date]).

CONFLICT OF INTEREST:

The authors declare no conflict of interest.

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